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By the side of the creek, at the base of the rock, I found *Eatonia obtusata* Gray, *Elymus canadensis* L., *Panicum virgatum* L., *P. crus-galli* G., and *P. crus-galli* var. *hispidum* Gr., *Aristida purpurea* Nutt., *Bouteloua oligostachya* Torr., *Munroa squarrosa* Torr., *Oryzopsis cuspidata* Benth., *Sporobolus airoides* Torr., and *Cenchrus tribuloides* L.

The Sand-burs have probably been introduced in the Pumpkin creek valley in the wool of sheep which have been herded there.

NOTES.—I did not find *Munroa* north of the Platte river valley. *Andropogon hallii* grew on the foot hills between Camp Clarke and the Court House ridge. These hills are sandy but are not true "sand hills," as that name is applied in the West.

Distichlis maritima is the chief pasture grass of the Platte valley in this vicinity! Other grasses, *Buchloë*, *Bouteloua oligostachya*, *Spartina cynosuroides*, *Agropyrum glaucum*, *Hordeum jubatum*, *Setaria glauca*, *S. viridis*, *Munroa squamosa*, and *Panicum crus-galli* also occur, but by no means as abundantly as the Distichlis.

I visited from fifteen to twenty of the islands in the river at this point. I found two grasses other than the common Platte valley species. They were *Glyceria distans* Wahl., and *Sporobolus depauperatus* Torr. The characteristic plant of these islands is *Shepherdia argentea*, a small shrubby tree known as the Buffalo-berry.—JARED G. SMITH, *Lincoln, Neb.*

ZOOLOGY.

The U. S. Fish Commission.—Anthozoa and Echinodermata of the Gulf Stream Slope of the New England Coast.—At various times during 1882, Prof. A. E. Verrill has given to the world notice of the remarkable marine fauna, to a great extent tropical in character, occupying the outer slope of the continental plateau off the southern coast of New England. The abundance of animal life on these banks may be judged from the fact that at a single haul, made on September 1, 1881, over ten thousand specimens were procured. In Prof. Verrill's words "a large number of species, belonging to various zoological groups, in this region are found living gregariously, in vast numbers, at particular spots, while they may not occur at all, or only sparingly, at other stations in similar depths, and apparently identical in temperature and character of bottom."

Among the discoveries of new and rare species during 1881, are the following Anthozoa: *Urticina longicornis*, *U. perdix*, *U. callosa*, *U. consors*, *Actinurus saginatus*, *Adamsia sociabilis*, all new species; *Pennatula aculea*, Dan. and Kov.; *P. borealis* Sars.; *Balticina finmarchica*, Sars.; *Anthroptilum grandiflorum*, Verrill; *Bathyactis symmetrica* Moseley; *Sagartia abyssicola* Verrill. In all thirty-three species, including seven *Pennatulaceæ*. *Adamsia sociabilis* always starts life upon a small shell, usually a *Cavolina*, occupied by a hermit-crab (*Hemipagurus socialis*, Smith), but eventually secretes a chitinous pellicle and absorbs the shell. *Flabellum goodei*, a very fragile coral which is tolerably common, has the power of restoring itself from mere fragments, and the same has been noted in *Parasmilia lymani* Pourtalis. The present year has yielded a remarkable new pennatulid (*Distichoptilum gracile*, Verrill), and two Gorgonians; *Acanthogorgia armata* V., dredged at 640 fathoms, and *Paramauricea borealis* V., from 234 fathoms; the former, when living, was bright orange, the latter pale salmon.

Pennatula borealis, previously known only from a few Norwegian specimens, has been taken both by Gloucester fishermen and the U. S. Fish Commission, at depths varying from 120 to 350 fathoms. The largest one was 21½ inches high nnd 5¼ broad. Some of the Actinians are very large,—*Urticina callosa* is four to seven inches high, and six to ten wide. Occasionally a barrel of large Urticinæ or of *Bolocera tuediæ* Gosse has been brought up at a single haul.

Acanella normanii V., a pretty bush-like gorgonian, was very abundant at some stations, as were also *Pennatula aculeata*; *Flabellum goodei*, and, in one spot, the usually rare *Anthomastus grandiflorus* V. One of the most striking instances of commensalism was that of *Epizoanthus paguriphilus* V., upon the previously rare hermit-crab *Parapaguras pilosimanus* Smith. The polyp forms the habitation of the crab out of its own tissues, and neither polyp nor crab have hitherto been found living separate. *Bathyactis symmetrica* has a wider bathymetrical and geographical range than any other known species, as it has been found off Florida, off the Azores, in the South Atlantic, at depths of from 1900 to 2650 fathoms; in the South Indian Ocean, from 1600 to 1950 fathoms; in the Malay Archipelago and West Pacific, in from 360 to 2440 fathoms; east of Japan, in 2300 to 2400 fathoms; off Valparaiso, in 1375 fathoms; on the New England coast, 225-252 fathoms.

The species of Echinodermata dredged in 1881 were in all forty-eight, twenty-two of which had not previously been found upon our coast; twenty-six may be considered as arctic, twenty-two are European, and fourteen or more have been taken off Florida or in the Gulf of Mexico.

Among these forms were *Dorocidaris papillata* (this was previously not supposed to occur north of the Gulf stream, off the coast of Florida); *Schizaster canaliferus* L. Ag., somewhat different from the type, probably a geographical variety, *Brissopsis lyrifera* Ag.; *Phormosoma sigsbei* A. Ag., *Archaster bairdii* sp. nov., in general appearance like *A. parelli* and *A. agasszii*; *Ophioglypha aurantiaca* sp. nov; *O. confragosa* Lyman, the type specimens of which were dredged by the Challenger off the La Plata in 600 fathoms; *Amphiura macilenta* sp. nov., very abundant off Martha's Vineyard; *Toxodora ferruginea*, a new genus and species of holothurian; *Asteras briareus* sp. nov., *Ophioglyphia sarsii* Lütken, which occurs in two varieties, one abundant in shallow water, the other, with less prominent disk-scales, common in the depths of the Bay of Fundy and off Nova Scotia; *O. signata*, sp. nov., not rare in deep water; and *Antedon dentatum*, first described by Say from Great Egg Harbor, N. J., as *Alectro dentata*.

At one spot two or three barrels of *Ophoglypha sarsii* came up at one haul; and *Archiaster agassizii* occurred in great numbers in one spot, at 337 fathoms.

The work of 1882 has obtained nearly all the species found in 1881, with the addition of the following: *Solaster earllii*, Verrill, a Diadema-like sea-urchin with nine arms, and of a bright scarlet color; *Lophaster furcifer; Astrogonium granulare, Astrophyton lamarckii*, also bright orange; *Asteronyx loveni* M and Tr., found upon a pennatulid at 700 fathoms; a new Ophioscolex, and *Rhizocrinus lofotensis*.

That the arms of an Ophiuran can be restored after they have been broken, or entirely lost, is well-known; but Prof. Verrill has seen cases in which the entire dorsal disk, with the contained viscera, had been lost and more or less restored. The species exhibiting this strange power was *Amphiura abdita* V., and the specimens were taken among *Zostera* at Noank, Conn. The dorsal disk is soft and swollen, and easily torn away, leaving only the jaws connecting the arms. In some the new disk, though perfect in form, had not reached more than one-third or one-half the diameter of the old one. Prof. Verrill thinks it probable that his *A. macilenta* is the true young of this species.

The headquarters of the U. S. Fish Commission, during both 1881 and 1882, were at Wood's Holl, Mass. During 1882 only five trips were taken to the Gulf Stream slope, but these were successful ones. The total number of Invertebrata now on the lists of the fauna of this belt is about 575, and this neither includes the Foraminifera nor the Entomostraca, which are numerous, and but few of the sponges. Of those determined, about 265 are Mollusca, including 14 Cephalopods;

85 are Crustacea; 60 Echinodermata, and 65 Annelids. About 75 species of fishes have also been found here. Many species, especially Crustacea, common in the two previous years, were scarce or absent in 1882. This, as well as the great destruction of the tile-fish (Lopholatilus) was, in Prof. Verrill's opinion, probably caused by a very severe storm that occurred in this region, which " by agitating the bottom water, forced outward the very cold water that, even in summer, occupies the great area of shallower sea, in less than 60 fathoms, along the coast, and thus caused a sudden lowering of the temperature along this narrow *warm zone* where the tile-fish and the crustacea referred to were formerly found."—W. N. L.

The Ectoderm of Spongilla.—According to one group of authorities the ectoderm of the larval sponge is transformed directly into that of the adult, while others claim that during metamorphosis the ectodermal larva entirely disappears. To ascertain the real facts in the case, Otto Maas contrived apparatus whereby a single embryo of spongilla could be kept constantly under observation during all its stages until sometime after attachment, and he concludes (*Zool. Anz.*, No. 316) that the larval ectoderm is transformed directly into that of the adult. At first the cells are columnar; after becoming attached the animals increase rapidly in size, which is accompanied by a flattening of the ectoderm, which is now cubical and growing flatter and flatter; the cell boundaries disappear, but always a sharp focusing will reveal a double contour. The ectodermal tissue is visible and the layer appears as an extremely thin hyaline membrane. Götte's sections in which no ectoderm was visible are interpreted as artificial products, the delicate ectodermal pellicle having been torn away in spots in the processes of preparation.

Copulatory Marks in Spiders.—There are very few instances in the animal kingdom of easily recognized marks of copulation. The cases of spermatophores protruding from the female genitalia, the male copulatory organs adhering in the female of the honey bee, and occasional male palpus sticking in the epigyne of spiders, and the hardened secretion forming a sort of pocket on the abdomens of certain butterflies (Parnassia, etc.), are all noticeable from their peculiarity. Dr. Bertkau finds that in spiders of the genus Argenna a similar sign occurs. Immediately after copulation the opening to the spermathecæ becomes covered with a little white or slightly rosy lid, which may be retained for a considerable time, even months. The origin of the secretion which produces these lids is utterly unknown, nor is it known whether it is produced by male or female.

New Glands in the Hemipterous Embryo.—It is well known that in the insect embryo traces of rudimentary appendages occur on the abdominal segments, but the histology goes to show that these evanescent structures on the first abdominal segment have lost their ambulatory function and have taken on another. One series of investigators believe that they are gills, the other as sense organs or glands. Mr. W. M. Wheeler has studied homologous structures in Cicada and Nepa, and finds (*Zool. Anz.*, 317) that in these forms there is no protruding appendage, but in its place a swollen ectodermal patch composed of greatly elongate epithelial cells, flat on the free surface and extending itself into the interior of the body. Proceeding from these cells was found a secretion which varied in character (in hardened specimens) in the two forms studied. In Cicada it formed a vacuolated transparent mass; in Nepa it formed a brush-like mass of elongate threads, apparently a thread to each secreting cell. There was apparently no connection with the nervous system, so that these organs in the Hemiptera must be regarded as glandular. Concerning the functions of these and other similar glands, it is difficult to say, but it is possible that they may fall among the category of silk-glands, and play a part in making these forms nauseous mouthfuls for insectivorous animals.

Abdominal Appendages of Lepismida.—Oudeman shows that there is a regular succession in the appearance of the ventral abdominal appendages in the Thysanurous form, *Thermophila furnorum.* In the smallest forms only the pair belonging to the ninth segment are present; increase in size brings the eighth pair, while only the full grown individuals have appendages on seventh, eighth, and ninth segments. Oudeman thinks this adverse to the view that these are rudimentary appendages homodynamous with the others.

The Segmentation of the Vertebrate Brain.—Mr. C. F. W. McClure attacks (*Zool. Anz.* 314) this oft-studied problem from another standpoint. He finds, in studying Amblystoma, Anolis, and the chick, that there is an evident segmentation of the nervous centre, it being divided, in an early stage, into segments or neuromeres, which alternate with the mesodermic somites. This segmentation extends into the cranial region, and embraces the whole of the brain, the fore-brain consisting of two (possibly a portion of a third), the mid-brain of two or three, and the hind-brain of six or five neuromeres, a total of ten, which correspond with the line of division between the nine mesodermal somites recognized by Van Wijhe in the head.

The Origin of the Pelvis.—Wiedersheim, in a preliminary account of the origin of the vertebrate pelvis (*Bericht d. Naturf. Gesellschaft*, February, IV., 1889), claims that the key to the first appearance of this structure is to be found in *Lepidosiren annectens*. Here the fibrous tissue of two pairs of myotomes in front of the cloaca through a process of chondrification reach a higher condition of connective tissue. These cartilaginous zones fuse in the *linea alba abdominis* to form an unpaired plate, thus affording a solid support for the free extremities. This process, which occurs again ontogenetically in the lowest urodele Batrachia, finds a parallel in the chondrification of a number of myotomes in the thoracic region of certain perennibranchiate Batrachia,—*i.e.*, in the rudiments of hyaline cartilage ventral ribs. The sternum of the Batrachia also falls in the same morphological category.

The vertebrate pelvis also owes its first appearance to the conversion into cartilage of a pair of abdominal myotomes—or to use the terms of human anatomy, of the *inscriptiones tendineæ* of the ventral body muscles.

The Stapedial Bones.—Dr. C. K. Hoffman claims (*Zool. Anz.*, 310) that the stapes in the reptiles arises from two sources. The otostapes arises from the outer layer of periotic mesoderm as a strong lateral process. At about the same time the hyoid arch is prolonged into a medial projection, the hyostapes, which unites with the otostapes to form the stapes, while the connection with the hyoid is lost. Hoffman thinks that similar relations can be traced in the Mammalia. The stapes proper is the otostapes, and the os lenticulare is the hyostapes. The fact that the facial nerve innervates the stapedial muscle on the lenticular portion lends probability to this view.

Frogs Eating Snakes.—(January NATURALIST, p. 74). If Mr. H. L. Roberts will turn to page 348 of my "Naturalist's Rambles About Home," he will find that I have described in full an instance of a frog (*Rana pipiens*) swallowing a snake. More recent observations have convinced me that such an occurrence is not as uncommon as might be supposed, considering the fear usually exhibited by a frog when a snake approaches.—CHARLES C. ABBOTT, *Trenton, N. J.*

Voice of Hyla andersonii.—The specimen of this beautiful batrachian referred to by Dr. Peters in the January NATURALIST is still in excellent health, and occasionally utters its characteristic cry, which should not be described by the word "peep," for this suggests a similarity to the cry of the Pickering's Hyla, which shrilly "peeps." The *andersonii* utters a single note, better described by the syllable "keck," which it usually repeats three or four times. It is not a frog-like note at all, but much resembles the call of the Virginia rail (*Rallus virginianus*). If the collector follows up any "peeper" in the marshes, he will not discover additional specimens of *Hyla andersonii.*—CHARLES C. ABBOTT.

The Trochlearis Nerve in Lizards.—Contrary to his earlier view, Hoffman now finds (*Zoöl. Auz.*, No. 310) that the trochlearis of the lizard at an early stage possesses a ganglion, and that it in all respects resembles one of the truly segmental nerves. This ganglion aborts at about the time of the deposition of the retinal pigment. He asks the question if this is not to be regarded as the first segmental nerve of the hind brain? In snakes, birds, and teleosts he finds no ganglion at any stage of development. He also suggests that the present distribution of the trochlearis may be secondary, and that formerly it was connected possibly with the occluding organs of the parietal eye.

Bats in the Wyandotte Cave, Indiana.—In the summer thousands and tens of thousands of bats assemble in Wyandotte cave, in Crawford county, and in other caves. A man living near Wyandotte cave, who had observed them for years, said that frequently in the early dusk of evening, he had seen a column of these flying animals from thirty to sixty feet in width and from two to three miles in length move from the mouth of the cave in a straight line going in a northwesterly direction. In a short time another column would move toward another point of the compass, and then perhaps another, each as long as the first, and, as long as within his observation, without straggling, and guided as by some reason or instinct that led these small-brained creatures to a known haunt or point. In the morning they would return, not in solid column, as they departed, but in large flocks or droves, passing into the cave, where they would be seen no more until the next evening. "Faneuil Hall" is a spacious corridor in Wyandotte cave, forty feet wide and eighteen to twenty feet high. Here daylight ends and darkness begins. Here we see the first of cave life. Here are clusters of bats which sleep in the daytime, hanging by their hind feet with their heads downward. They hibernate in myriads in the winter, attached to the sides and roof by their hind feet. The surface of the stone being porous affords great attachment to their claws, while the peculiar construction of their feet makes the grasp of their claws stronger the more and the longer the weight is attached to them. They collect in clusters, so that they are in contact with one another, and the animal heat thus retained assists in their comfort. The cave temperature ranges from 58° in the fall down to 52° or 53° in the spring, and the cave "breathes" semi-annually at the autumnal and vernal equinoxes, having a discharge of warm air in the fall, and an inflow of cool air during the winter. In the cooler weather the bats are not satisfied with a single layer, but are attached like swarms of bees, hanging down. The highest temperature in the highest part of the cave is 66° in the winter. This cave is floored in two stories. Passing on one goes through numerous halls, corridors, arches, and domes, which are occupied to a greater or less extent by these Chiroptera. For reasons known to themselves alone some of the rooms are favored spots, while others are rarely occupied by them.

The southern route in the cave was discovered in 1850, and was unvisited up to that time by quadrupeds like raccoons and opossums, because the opening was too small for them to pass through. The current of air passing in was very slight, and the temperature uniform. This made it a favorite place for these furry flyers. The second hall, "Bats' Lodge," as it is named, is a spacious room in which the bats delight to assemble for council purposes, it would appear, as well as sleep. I saw the ceiling largely covered with clusters of them crowded closely together. Disturbed by our entrance, the room was filled with their slight, plaintive, whining, whispering voices and the disagreeable odor of their bodies. My first visit was in the early autumn. The results noted were taken in December, when the outer world was cold enough to close the Ohio river with ice, and the thermometer at the mouth of the cave was from six to twelve degrees below zero. The bats were evidently hibernating, and, although somewhat torpid, yet, when disturbed, in falling they dropped a distance of six or eight feet, their bodies rarely fell to the ground. Recovering the use of their wings, they would fly back to one of the clusters. There are two kinds of bats in Indiana—the red bat and the common black bat. The red bat is the Southern type, and is rare, only occasional specimens having been taken.—John Collett, in *Indianapolis Journal.*

Zoological News.—General.—Volume XXX., part I, of the *Quarterly Journal of Microscopical Science* contains an index extending from 1853 to 1888; an Index to the Transactions of the same society from 1844 to 1852; and to the Proceedings of the Dublin Microscopical Society from 1865 to 1880.

Sponges.—Von Lindenfeld thinks that the collared endoderm cells of the sponges are never free, but are imbedded in a ground substance from which they are capable of some protrusion. He also thinks that the "membrane" recently described by Dendy and Sollas in certain sponges is, in reality, but the free surface of this ground substance.

Worms.—*Otoplana intemedia* is a new turbellarian described by Dr. du Plessis as combining many features. It has no eyes, but has an otocyst in front of the brain, ciliated pits on either side of the otocyst like those of the nemertines, long, symmetrically placed tactile hairs on each side of the body; the surface of the body is covered with sticky cells (Klebzellen); there is a single median posterior sexual opening; and the alimentary canal is dendrocœlous.

Mollusca.—Pelseneer (*Zoöl. Anz.*, 309) denies that the hooks of the pteropod molluscs have any morphological value, a view at variance with that expressed by Schalfejeff.

The thirtieth volume of the Challenger series concludes with a supplementary report upon the Polyzoa, and is by Mr. A. W. Waters. It consists of 41 pages and 3 plates.

Fishes.—Prof. A. C. Haddon writes to *Nature* (Jan. 17, '89) that apparently the tail in Periophthalmus is an efficient organ of respiration. He also describes the methods of fishing for turtles with the suckfish or remora, employed by the natives on the shores of Lowes Straits.

The American genus Carpiodes (Catostomidæ) has been found in Australia.

Reptiles.—Dr. G. Baur, in his Osteological Notes on Reptiles (*Zoöl. Anz.*, No. 296), calls attention to the fact that in *Podocnemis dumeriliana* the neck vertebræ possess the same saddle-shaped articulation of the centra which hitherto has not been found outside the group of birds. Baur also characterizes anew from osteological details the Trionychidæ, Sternothæridæ, Podocnemidæ, as well as adding some notes on other families. He maintains, contrary to Boulenger, the distinctness of Erymnochelys from Podocnemis.

Arthropoda.—Mr. F. A. A. Skuse recently described before the Linnæan Society of New South Wales a new genus (Batrachomyia) and two new species of flies closely allied to Oscinis, which are peculiar in laying their eggs beneath the skin of frogs.

A comparative study of the alimentary canal of the larvæ and imagines of the Ephemeridæ is interesting, since these forms take no nourishment in the adult condition. Fritze (Bericht Naturf. Gesellsch. Freiburg, IV.) has made such a study, carefully detailing the histology of several species in all stages. His results in brief are that at no time is the alimentary canal rudimentary, but that at the time of metamorphosis it becomes emptied of food, and is then distended with water, so that the columnar epithelium of the mesenteron is stretched into pavement epithelium. Later the water is replaced with air, which is serviceable in lessening the specific gravity of the perfect insects.

Birds.—A short note in the March *Geologist*, by W. K. Parker, tends to somewhat rehabilitate the old and still popular idea that swifts and swallows are related. Though Mr. Parker places the former among the Picariæ, he says that they are on the passerine verge of the group, and have an ægithognathous palate, *i. e.*, the vomer is fused with the floor of the nasal labyrinth. The proportions of the wing in the group vary greatly, as may be seen from the following measurements of its members in two of the largest Cypselidæ:

	Humerus.	Ulna.	Manus.
Macropteryx mystacea,	24 mm.	29 mm.	47 mm.
Chætura caudaca,	17 "	24 "	57 "

Swifts and humming-birds, like passerines, have no second phalanx on the "pollex," nor a third on the index.

Aphriza virgata affords Dr. Shufeldt material for an essay regarding the osteology and taxonomy of the snipe, plovers, oyster-catchers, and surf-birds (*Jour. Morph.* II., Part 2). He concludes that the existing classifications do not properly represent the relations of the Limicoline birds, and that the Aphriza and Arenaria should each be raised to family rank.

Mammals.—Mr. Robert Gray (*Zoölogist,* March) relates the discovery of a herd of narwhals asleep, with the spiracles under water in many cases; and states his conviction, which is that of many intelligent whalemen, that the Cetacea habitually sleep under water, and either wake to breathe, or do so by reflex motions. Whales have been seen to emerge from under fields of ice without air-holes, and they disappear from the surface with some regularity. It is only when the water is smooth that Cetaceans have been found asleep on the surface.

J. E. Harting (*Zoölogist*, March, 1889) states that the roebuck is still found wild in Dorsetshire, and that there are a few near Wigton, in Cumberland; otherwise, it is now almost entirely confined to Scotland. Even in Dorset its presence is due to a reintroduction. A curious fact in the life history of the roe is that, though the rutting season is in August, the ovum lies dormant until December, when it developes at the normal rate. Occasionally a female roe has horns.

The discovery in the Hebrides of *Mus hibernicus*, a species which, like *Mus decumanus*, has the tail shorter than the head and body, and the ears relatively small, forms the subject of the first article in the *Zoölogist* for June, 1889. It is a smaller and more elegant animal than *M. decumanus*, with finer fur, of a dark silvery gray, almost black tint, upon the back. The far of the sides is paler, and the under surface is silvery mouse-gray.

In the September issue of the same periodical Mr. T. Southwell states his belief that *M. hibernicus* is a hybrid.

Alphonse Milne Edwards has recently described a peculiar marsupial from New Guinea, under the name *Dactylopsia palpator*, remarkable for the enormous length of the fourth digit of the hand, which nearly equals the elongate third digit of the Malagassy Aye-Aye.

PHYSIOLOGY.[1]

Nature of Knee-jerk.—There are two theories of the nature of the knee-jerk phenomenon: one regards the process as entirely peripheral, the muscle fibres being directly stimulated to contraction by the twitch of the tendon; the other regards the action as reflex. Objections to both exist; to the peripheral theory, especially the fact that the reflex arc must be functional; to the reflex theory, the fact that the time necessary is very short—only about one-fourth that of other reflex actions. Dr. Lombard, who made an elaborate study of the phenomenon in 1887,[2] brings forward the results of experiments to prove the tenability of the reflex theory.[3] These experiments were made on

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[1] This department is edited by Dr. Frederic S. Lee, Bryn Mawr College, Bryn Mawr, Penna.

[2] See *American Journal of Psychology*, Vol. I.

[3] *Journal of Physiology*, Vol. X, p. 122.